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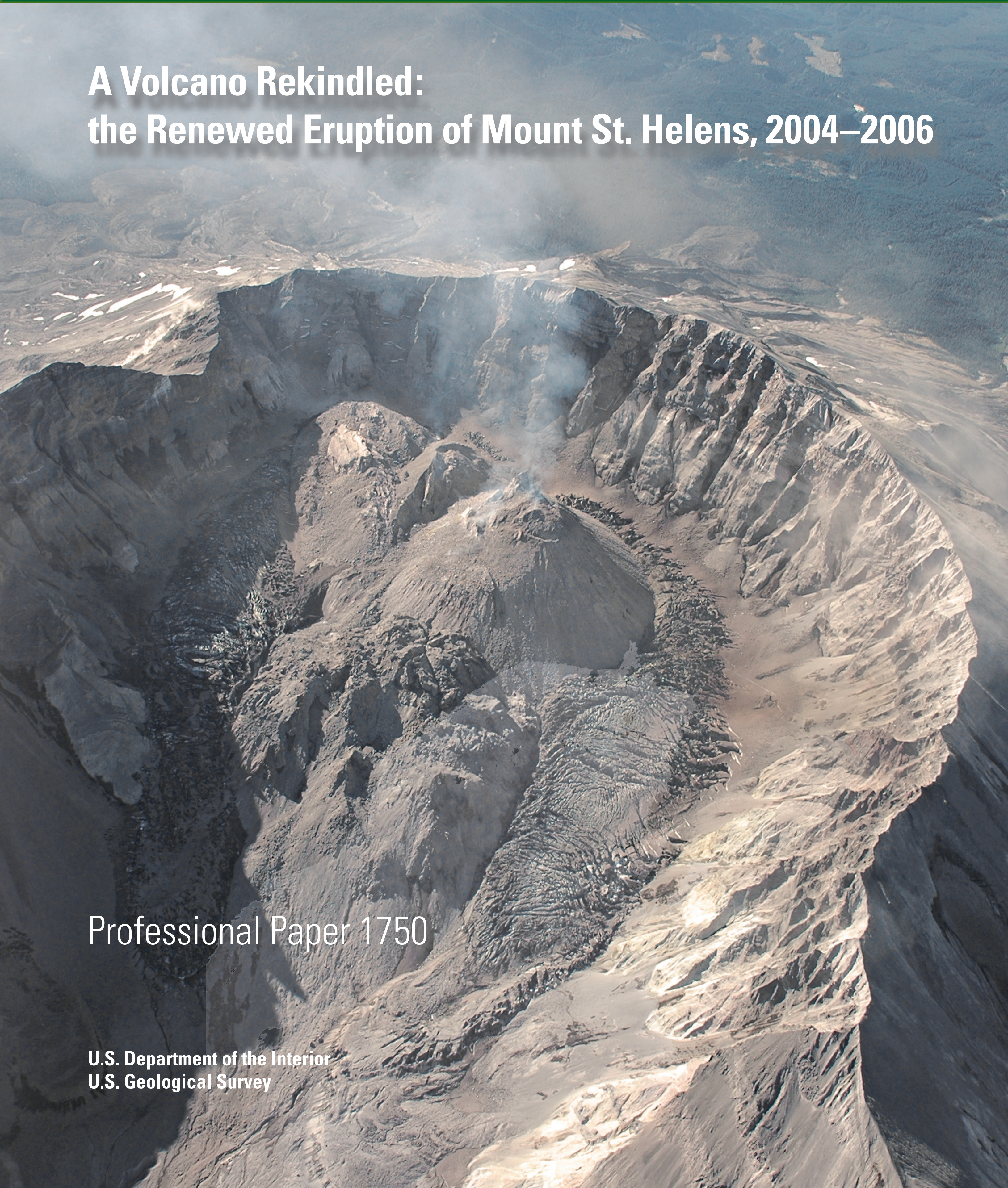
A Volcano Rekindled: the Renewed Eruption of Mount St. Helens, 2004–2006



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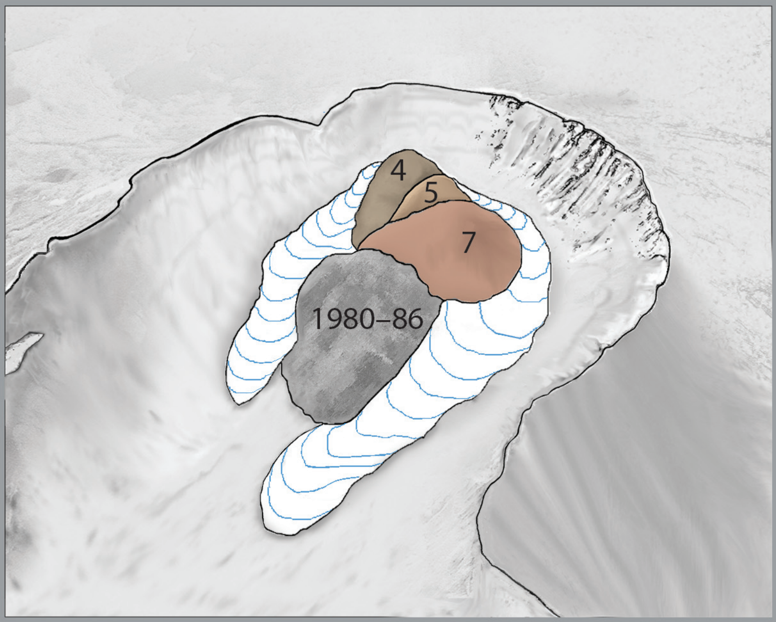
COVER

Mount St. Helens crater and new dome, September 12, 2006. Oblique aerial view from the north. Crater rim is about 2 km across. Spines 4, 5, and 7 of the new dome (see labeled sketch below) form conical masses that have nearly or completely buried other spines of the eruptive sequence. At slightly lower altitude, Crater Glacier's east and west arms nestle the craggy 1980–86 dome as they plunge northward from the crater floor. USGS photo by W.E. Scott.



A Volcano Rekindled: The Renewed Eruption of Mount St. Helens, 2004–2006

Edited by David R. Sherrod, William E. Scott, and Peter H. Stauffer

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Foreword

Late September and early October 2004 saw intense seismic unrest, rapid ground deformation, and explosions heralding the renewal of lava-dome growth in the crater of Mount St. Helens, Washington. Thus ended the relative calm of two decades since the renowned 1980–86 eruptions. Memories of the May 18, 1980, tragedy and its aftermath prompted a high level of concern among the public, public officials, and the media. Response to this unrest and eruption was led by scientists at the U.S. Geological Survey's (USGS) David A. Johnston Cascades Volcano Observatory (CVO). Established following the 1980 eruption, CVO was named for the spirited young USGS volcanologist who lost his life during the initial minutes of the May 18 cataclysm. USGS scientists worked in close cooperation with CVO's long-time partner in monitoring the volcanoes of Washington and Oregon, the Pacific Northwest Seismic Network at the University of Washington. This cooperation ensured that local land and emergency managers, public officials, key government agencies, media representatives, and the public received the information needed to protect life and property, as well as to appreciate the spectacle of an erupting volcano. USGS scientists from sister volcano observatories—Alaska, Hawaiian, Long Valley, and Yellowstone—and the broader USGS community contributed significantly to the effort. USGS scientists relied on lessons learned from responding to previous volcanic crises in the United States and abroad. Scientists from more than a dozen academic institutions undertook valuable scientific studies of the eruption. New instrumentation from the National Science Foundation-sponsored Plate Boundary Observatory aided in geodetic monitoring. The response was bolstered by vast improvements in monitoring technology, information management, and understanding of volcanic processes that were spawned by the 1980 eruption and other eruptions during the late 20th century.

The USGS is proud to have cooperated closely with the Gifford Pinchot National Forest, home of the Mount St. Helens National Volcanic Monument, the Washington State Emergency Management Division, county emergency-management agencies, the National Weather Service, the Federal Aviation Administration, and the Federal Emergency Management Agency in fulfilling its mandated role under the Disaster Relief Act of 1974 (P.L.93–288) "to provide technical assistance to State and local governments to ensure timely and effective disaster warning is provided." This multichaptered Professional Paper, released as the most recent period of the Mount St. Helens lava-dome building ends after nearly three and one-half years of continuous activity, adds to our understanding of how volcanic systems work, and how scientists must work together with a broad array of agencies and public officials to mitigate risk from volcanic activity.

Occurring more than a quarter century ago, the catastrophic 1980 eruption of Mount St. Helens may seem to some as just a historical footnote. This Professional Paper documenting both the volcano's recent activity and the need for coordinated warning and disaster response should serve the public well as a reminder of the challenges and consequences of living near an active volcano. Previous USGS Director Dallas Peck said it best: "The lessons of Mount St. Helens must not—and will not—be forgotten."

Mark D. Myers
Director,
U.S. Geological Survey

Anthony I. Qamar, 1943–2005

Research Assistant Professor, University of Washington
Co-Principal Investigator, Pacific Northwest Seismic Network
Washington State Seismologist, 1988–2005

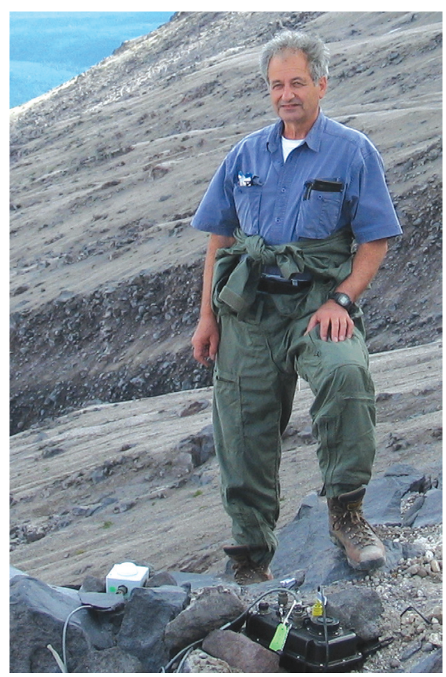
Anthony "Tony" Qamar was a highly regarded, generous scientist whose career encompassed the Mount St. Helens eruptions of 1980–86 and 2004 (ongoing at this writing, June 2007). Tony and his colleague, Dan Johnson, were killed in a tragic auto accident October 4, 2005, while traveling to Washington's Olympic Peninsula to retrieve a GPS receiver.

Tony loved mountains, particularly volcanoes. Unbeknownst to many colleagues, Tony was an accomplished climber with major first ascents to his credit. He often combined his professional world with his love of the outdoors by accepting the task of repairing remote and inaccessible seismographs, such as those high on Mount Rainier and Glacier Peak. In 1980 he was one of the first scientists to appear at Mount St. Helens in response to precursory seismicity. Camping in the snow with a portable seismograph and thermal infrared imager, he witnessed and recorded many of the early phreatic eruptions.

In September 2004, Tony again became immersed in volcano seismology as Mount St. Helens reawakened. Moving from his regular office, he set up "camp" in a small, cramped room across from the seismology lab, where he was a resource for the staff and seismology students at the University of Washington's Department of Earth and Space Sciences and also for news media who used the lab during the early chaotic months of the eruption. He developed several automated computer codes (in FORTRAN) that enabled the staff of the Cascades Volcano Observatory and the Pacific Northwest Seismic Network to make sense of the overwhelming number of earthquakes and to track changes in real time. The paper on which he is first author in this volume (chap. 3) is based on these computational efforts and is, we hope, close to the paper he intended to write.

While fundamentally a seismologist interested in the stresses that trigger earthquakes, Tony let his curiosity drive his research in diverse directions. He published papers on the seismic structure of the Earth's inner core, seismic signals generated by meteors or the space shuttle, ice quakes from glaciers recorded by high-frequency seismographs, and the slowly straining tectonic plates as detected by GPS receivers.

Tony was an excellent classroom teacher and even better mentor. As a research collaborator he was generous with his time and ideas, interested more in working with others to achieve a better understanding of a scientific problem than in claiming his piece of the intellectual pie through first-author publications. Those around him were enriched by his presence, knowing he was a friend first and professor second. Students frequently approached him with questions, both technical and personal, and they always left with their answers in hand and their egos intact. The hole left by his passing is both wide and deep.



Tony Qamar poses near seismic equipment he helped to install on the flanks of Mount St. Helens in the summer of 2005

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From the Foreword by Mark D. Myers